

TRAFFIC ENGINEERING ASSESSMENT

of

KETTLE RUN ROAD

in

EVESHAM TOWNSHIP, BURLINGTON COUNTY, NJ

DRAFT

OCTOBER, 2000

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INTRODUCTION

This report presents the results of a traffic engineering assessment of Kettle Run Road from its intersection with Tomlinson Mill Road just south of the Marlton Parkway/Taunton Lake Road intersection south and then east to an intersection with Hopewell Road near the southern limits of the Township. The assessment has been conducted at the request of Township Council in accordance with the proposal for a "Kettle Run Road Traffic Study, Aerohaven Recreational Fields" — from Orth-Rodgers & Associates, Inc. to Florence Ricci, Township Manager, dated April 10, 2000.

The purpose of the traffic engineering study is to provide background information to Township Council in their continuing planning efforts relative to a proposed new sports/recreation complex which might be developed by the Township on the site of the former Aerohaven Airport. The site is located on the east side of Kettle Run Road about three miles south of the intersection with Tomlinson Mill Road. Access to the recreation complex, if developed, would be provided via Kettle Run Road. Given the site's location it is anticipated that the great majority of traffic generated by the site will be oriented to the north — i.e., will enter the site via a left-turn from Kettle Run Road and will exit via a right-turn onto Kettle Run Road.

The traffic engineering assessment, as discussed herein, has involved the following tasks:

- Conduct of a detailed field inventory of Kettle Run Road noting physical characteristics and posted traffic regulations.
- Conduct of a series of traffic counts at various locations along Kettle Run Road — on weekdays and weekends.
- Comparison of existing traffic volumes with roadway capacity and also with present volumes using other roads within the Township.
- Conduct of a limited number of 'spot speed' surveys at various locations along Kettle Run Road to determine existing travel speeds.
- Review of traffic accident experience along Kettle Run Road to identify possible safety concerns.

- Identification of possible improvements to Kettle Run Road to provide for increased capacity and/or improved safety — to better serve present traffic and to be able to accommodate possible future increases in traffic demand which might be generated by a possible new recreation complex.
- Estimation of 'order-of-magnitude' costs to implement identified roadway improvements.

Each of these topics is discussed in the report chapters which follow.

EXISTING ROADWAY CONDITIONS

Kettle Run Road is a two-lane Township road which extends south and east from an intersection with Tomlinson Mill Road (just south of the Marlton Parkway/Taunton Lake Road intersection) for a distance of about 4.3 miles to its terminus at an intersection with Hopewell Road.¹⁾ Kettle Run Road has a paved width of 18.5 to 19 feet. There are no shoulders or sidewalks.

The posted speed limit on Kettle Run Road is 40 mph but there are several curves along the road with a posted reduced speed warning of 20, 25, or 30 mph (between Braddock Mill Road and Bortons Road). There is a posted warning speed of 10 mph at the curve on Kettle Run Road at its intersection with Sycamore Avenue. Street lights are in place at only a few selected locations — at some roadway intersections and some driveways.

Kettle Run Road is classified as a 'minor collector' roadway in the "Township Master Plan". 'Collector Streets' as defined in the 'Master Plan' provide for both movement and access, serve as a link between local streets and the arterial road system, and carry light to moderate traffic volumes (i.e., up to 7500 vehicles per day). Design parameters for a 'minor collector' as outlined in the 'Master Plan' suggest a cartway (or paved) width of 34 feet within a right of way of 52 feet.

Kettle Run Road, along the frontage of the Aerohaven Airport site, is relatively flat and straight. It appears that a site access which provides for adequate sight distance can be easily located. However, it is essential that such a location be carefully chosen to ensure that adequate sight distance is available and that safe site entry and exit can be provided.

A mounted aerial photograph which shows all posted traffic signs, street light locations, and pavement markings along Kettle Run Road has been provided to the Township.

¹⁾

Kettle Run Road is actually discontinuous. It begins again further south at Dock Road and extends across the Township line into Camden County.

PRESENT TRAFFIC VOLUMES AND PATTERNS

A series of automatic traffic recorder counts (i.e., rubber hose counts) were conducted at three different locations along Kettle Run Road in early June, 2000. In addition, ATR counts were also conducted on Tomlinson Mill Road between Kettle Run Road and Marlton Parkway/Taunton Lake Road and on Hopewell Road between Kettle Run Road and Borton's Road. Detailed hour-by-hour plots of the traffic count results (for separate weekdays and for a Saturday and a Sunday) are provided in an appendix to this report.

Review of the traffic count data indicates the following with regard to 24-hour traffic levels (total, both directions):

	<u>Weekday</u>	<u>Saturday</u>	<u>Sunday</u>
Kettle Run Road			
between Tomlinson Mill and Braddock Mill Roads	2900	2000	1600
between Braddock Mill Road and Sycamore Avenue	3400	2400	1900
between Sycamore Avenue and Hopewell Road	4100	3500	2900
Tomlinson Mill Road			
north of Kettle Run Road	6800	5300	4200
Hopewell Road			
north of Kettle Run Road	7200	6200	5300

As indicated, and as is typical, weekday traffic is higher than Saturday volume by as little as 15% and as much as 45%. Saturday volumes are generally about 20% higher than Sunday 24-hour volumes.

Further review of the hourly pattern of weekday traffic indicates that peak traffic is generally observed around 7:00 A.M. - 8:00 A.M. and between 4:00 P.M. and 6:00 P.M. Again, this is typical of most roads in the region with most people traveling to work (and children to school) around 8:00 A.M. and with most people traveling home from work or to/from other

activities around 5:00 P.M. Volumes are typically reduced in the midday period and peak volumes also tend to fall off after 6:00 P.M.

Review of the Saturday traffic count data indicates that volume tends to build during the mid-morning (i.e., 10:00 A.M.) and stays relatively high throughout the late afternoon/early evening (i.e., 4:00 P.M. to 6:00 P.M.). Peak hourly volumes on Saturday are generally much less (about 50%) than the P.M. peak commuter hour volumes noted on a weekday.

The hourly traffic pattern on Sunday is also slightly different with volume tending to build slightly later in the morning and beginning to decrease slightly earlier in the late afternoon. Peak hourly volumes noted on Sunday are about the same as those observed on Saturday. However, the peak hourly volume on Sunday is observed for only a two-three hour period while Saturday peak demand extends over a somewhat longer period.

For comparison purposes, it is of some interest to note the following 24-hour traffic volumes on other roads in the Township:

-	Tuckerton Road near Elmwood Road	17,000 vehicles
-	Elmwood Road south of Route 70	9,000 vehicles
-	Marlton Parkway near Wescott Road	16,000 vehicles
-	Evesboro-Medford Road near Troth Road	7,000 vehicles
-	Greentree Road near N. Locust Avenue	19,000 vehicles
-	North Locust Avenue near Greentree Road	1,700 vehicles

Volume-Capacity and Level of Service

While volumes provide an indication of the importance and utilization of a road within the system hierarchy, another important measure is the ratio of peak hour volume to roadway capacity. This ratio, expressed as a 'level of service', provides an indication of how efficiently traffic moves along the road and the degree of constraint which is experienced by motorists using the road. The theoretical capacity of a two-lane road is 2800 vehicles per hour (total, both directions). However, this capacity is rarely, if ever, achieved. Road widths, topography, proximity of obstructions to the roadway edge and even the pattern and composition of traffic using the road all tend to reduce capacity. In addition, capacity conditions are not ideal.

Typically, platooning of vehicles becomes intense at this level and motorists feel significantly constrained. Level of service along a two-lane roadway is generally defined by traffic engineers as follows:

Level of Service 'A' or 'B'

Drivers feel little constraint to their freedom of movement.

Platooning of vehicles begins to occur at the lower levels of 'B'.

Level of Service 'C' and 'D'

Drivers begin to feel more constraint. More platoons begin to form. Turning vehicles and/or roadside distractions cause major shockwaves in the traffic stream. Level of Service 'D' represents the highest flow rate that can be maintained for any length of time over an extended road section without a high probability of breakdown.

Level of Service 'E'

This is capacity. Operating conditions at this level of service are unstable and difficult to predict. Platooning becomes intense.

Level of Service 'F'

This service level indicates heavily congested flow with traffic demand exceeding capacity.

Consideration of existing physical characteristics and present traffic patterns and composition indicate the capacity of Kettle Run Road (i.e., Level of Service 'E') is about 2200 vehicles per hour. However, calculation of Level of Service 'D' limits indicate a volume of only about 700-800 vehicles per hour while hourly volumes in the 400-500 range suggest Level of Service 'C' limits.

Present traffic volumes along Kettle Run Road during the weekday P.M. commuter peak approximate 400 vehicles while peak Saturday afternoon volumes range from about 150 to 250 vehicles per hour. In other words, present weekday commuter peak hour volumes are in the Level of Service 'C' range while Saturday peak volumes suggest Level of Service 'B' conditions.

In summary, from a capacity viewpoint, Kettle Run Road could accommodate an additional 300 - 400 vehicles during the P.M. commuter peak hour and an additional 500 vehicles during the Saturday afternoon peak hour before motorists would begin to feel some substantial degree of constraint. However, consideration of existing physical characteristics including relatively narrow width and lack of shoulders as well as the existence of several curves also suggest that Kettle Run Road might be able to accommodate a much lesser increase from a traffic safety viewpoint.

TRAFFIC ACCIDENT EXPERIENCE

Traffic accident reports for Kettle Run Road were obtained from the Evesham Township Police Department. Accident data were provided for the section of Kettle Run Road north of Braddock Mill Road for the 18-month period from January, 1999 to June, 2000. Accident reports for the segment of Kettle Run Road south of Braddock Mill Road were provided for the 38-month period from April, 1997 to June, 2000.

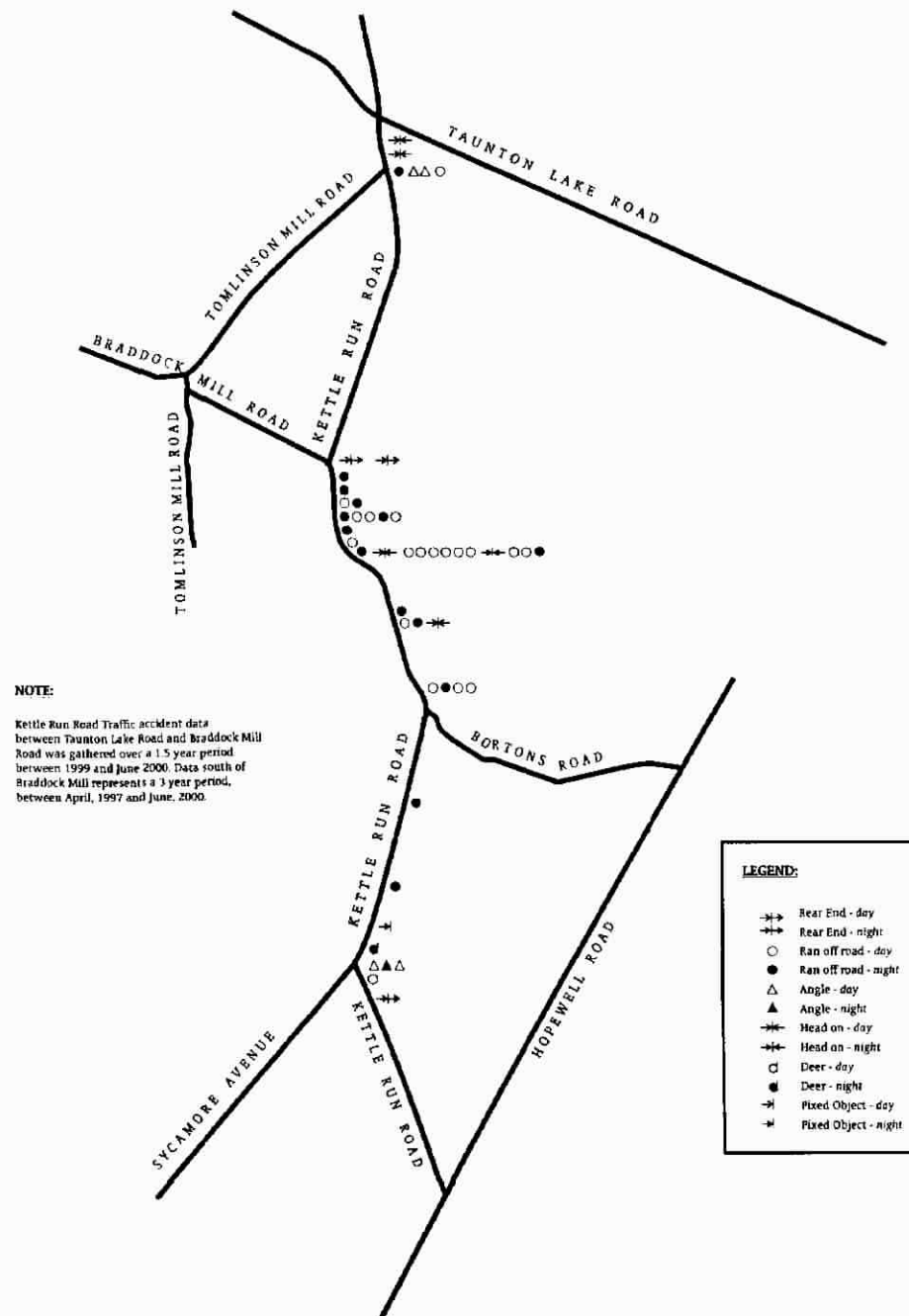
Review of the accident data indicates that the highest accident rate was exhibited along the section of Kettle Run Road between Braddock Mill Road and Borton's Road (as shown in Figure 1). Further analysis indicated the following:

- 57% of accidents occurred during the day while 43% occurred at night
- about one-third of the accidents occurred under "wet" roadway conditions
- about 40% of drivers involved in the accidents were "local" and another 40% were County residents

It is of some interest to note that 28 of the 33 accidents which occurred between Braddock Mill Road and Borton's Road involved vehicles that "ran off the road". This is the road segment which includes a number of curves marked by reduced warning speeds and chevrons.

There was also a cluster of accidents noted at/near the intersection of Kettle Run Road and Sycamore Avenue with several being 'angle-type', one a 'rear-end', and one involving a deer.

Location of Traffic Accidents Kettle Run Road Evesham Township Burlington County, New Jersey



NOTE:

Kettle Run Road Traffic accident data between Taunton Lake Road and Braddock Mill Road was gathered over a 1.5 year period between 1999 and June 2000. Data south of Braddock Mill represents a 1 year period, between April, 1997 and June, 2000.

LEGEND:

- Rear End - day
- Rear End - night
- Ran off road - day
- Ran off road - night
- △ Angle - day
- ▲ Angle - night
- Head on - day
- Head on - night
- Deer - day
- Deer - night
- Fixed Object - day
- Fixed Object - night

SPOT SPEED SURVEYS

A series of spot speed surveys were conducted along Kettle Run Road via radar gun during early afternoon periods on different weekdays in June and July, 2000. Spot speeds were noted for a total of 20 vehicles per direction at each location. The results are summarized in the following table for each of three survey locations along Kettle Run Road and also for a survey location on Tomlinson Mill Road between Kettle Run Road and Marlton Parkway/Taunton Lake Road. Review of the results indicates the following:

Site 1: On Tomlinson Mill Road between Taunton Lake Road and Kettle Run Road. Northbound traffic on Tomlinson Mill Road between Taunton Lake Road and Kettle Run Road was observed to travel between 22 and 31 miles per hour. The 85th percentile speed of the northbound traffic is 29 miles per hour. The 85th percentile speed is the speed exceeded by 15 percent of the vehicles surveyed. Therefore, 15 percent of the northbound traffic on Tomlinson Mill Road at this location traveled at speeds greater than 29 miles per hour. Southbound Tomlinson Mill traffic at this location was observed to travel between 24 and 36 miles per hour. The 85th percentile speed of southbound traffic is 33 miles per hour.

Site 2: On Kettle Run Road between Tomlinson Mill Road and Braddock Mill Road. Northbound traffic on Kettle Run Road between Tomlinson Mill Road and Braddock Mill Road was observed to travel between 29 and 39 miles per hour. The range of speed of southbound vehicles at this location is 28 to 38 miles per hour. The 85th percentile speeds of northbound and southbound traffic are 36 mph and 35 mph, respectively.

Site 3: On Kettle Run Road between Braddock Mill Road and Sycamore Avenue. Northbound traffic on Kettle Run Road between Braddock Mill Road and Sycamore Avenue was observed to travel between 40 and 57 miles per hour. The range of speed of southbound vehicles at this location is 35 to 50 miles per hour. The 85th percentile speeds of northbound and southbound traffic are 51 mph and 46 mph, respectively (despite the posted speed limit of 40 mph).

Site 4: On Kettle Run Road between Sycamore Avenue and Hopewell Road. Northbound traffic on Kettle Run Road between Sycamore Avenue and Hopewell Road was observed to travel between 30 and 41 miles per hour. The range of speed of southbound vehicles at this location is 30 to 42 miles per hour. The 85th percentile speed of northbound and southbound traffic is 39 mph.

Spot Speed Studies By Location

Tomlinson Mill Road between
Taunton Lake Road and Kettle Run Road
Tuesday July 11, 2000 12:30 P.M.

<u>NB</u>	<u>SB</u>
22	24
23	25
24	26
24	26
24	27
25	27
25	28
25	28
26	28
26	29
27	29
27	30
28	30
28	31
28	32
29	32
29	33
30	34
30	35
31	36

Kettle Run Road between
Tomlinson Mill Road and Braddock Mill Road
Tuesday July 11, 2000, 1:15 P.M.

<u>NB</u>	<u>SB</u>
29	28
30	29
30	30
31	30
31	31
32	31
32	31
32	32
33	32
33	33
33	33
34	33
34	33
35	34
35	34
36	35
36	35
36	35
37	36
39	38

Kettle Run Road between
Braddock Mill Road and Sycamore Avenue
Wednesday June 7, 2000, 2:00 P.M.

<u>NB</u>	<u>SB</u>
40	35
40	36
42	39
43	42
43	43
45	43
46	43
46	43
46	43
46	44
47	45
47	45
48	45
49	46
50	46
51	46
51	47
54	49
57	50

Kettle Run Road between
Sycamore Avenue and Hopewell Road
Tuesday July 11, 2000, 2:00 P.M.

<u>NB</u>	<u>SB</u>
30	30
31	31
31	31
32	32
32	32
33	33
33	33
34	34
34	34
35	35
35	35
35	35
36	36
36	36
38	38
38	38
39	39
40	40
40	40
41	42

In addition to the survey locations along Kettle Run Road, 'spot speeds' were also noted at a survey location on Hopewell Road between Kettle Run Road and Borton's Road. That survey indicated that northbound traffic traveled at speeds between 43 and 54 mph while southbound traffic traveled at speeds ranging from 43 to 55 mph. The respective 85th percentile speeds were 52 mph for northbound traffic and 51 mph for southbound traffic.

It should be noted that posted speed limit regulations are typically based upon the 85th percentile speed.

FINDINGS AND RECOMMENDATIONS

This traffic engineering assessment of Kettle Run Road suggests that the roadway is deficient in terms of its cartway width, lack of shoulders, lack of adequate street lighting and its substandard alignment. Still, Kettle Run Road carries about 3,000 to 4,000 vehicles (total, both directions) on an average 24-hour weekday and lesser volumes on the weekend in a relatively efficient manner. Motorists typically feel little restraint in movement and encounter little if any congestion even during peak traffic hours.

Peak hourly volumes are presently only at about one-half of comfortable service levels from a capacity viewpoint (i.e., Level of Service 'D') during the weekday commuter peak. Saturday afternoon peak hourly volumes are about one-half or less of the weekday P.M. commuter peak demand.

However, review of accident experience along Kettle Run Road suggests that the identified deficiencies do result in some safety shortcomings. Accident experience along the road segment between Braddock Mill Road and Borton's Road in particular indicates that some improvement should be considered to more safely accommodate existing traffic let alone serve any possible increase in volume which could result from development of a new sports/recreation complex on the site of the former Aerohaven Airport.

At the same time, however, it must be recognized that existing wetlands and other environmental constraints limit the degree of road improvement which may be feasible. No significant road re-alignment or major widening appears possible. Still, there are a number of actions/improvements which might be implemented to better serve existing traffic as well as any projected increase.

Proposed Improvement Program

The improvement program for Kettle Run Road which is outlined below has been developed with an awareness of existing constraints as well as knowledge of existing traffic operations/conditions as identified in this traffic engineering assessment. Proposed improvements are outlined in three parts:

- initial actions which might be considered to more safely and efficiently serve existing traffic volumes

- improvements to two existing intersections which should be considered if traffic demand along Kettle Run Road is expected to increase significantly in the future
- a major site access improvement/treatment which will be needed to provide for safe and efficient movement to and from the Aerohaven site if it is developed as a major new sports/recreation complex

Specific initial actions which are recommended for implementation as soon as feasible in order to provide for safer movement along Kettle Run Road include the following:

- 1) All existing regulatory and warning signs along Kettle Run Road (total of about 85 signs) should be replaced. All new signs should be positioned to conform to the Manual on Uniform Traffic Control Devices and installed at the proper height.
- 2) The number of chevron signs which guide motorists through the various curves along Kettle Run Road should be significantly increased. A total of about 15 additional chevron signs should be installed at various locations along the roadway.
- 3) All pavement markings should be repainted with epoxy paint using large glass beads for better reflectivity during inclement weather.
- 4) Highway/street lighting should be installed in the vicinity of the most critical curves in order to provide better night time illumination.
- 5) All side road symbol signs should have supplemental street name signs mounted below them.

It is recommended that NJDOT be requested to re-examine existing posted curve signs (including the supplemental advisory speed designations), to ensure that they comply with current standards and practice. NJDOT might also be requested to re-evaluate 'no passing' zones along Kettle Run Road and recommend any required changes.

Preliminary, order-of-magnitude estimates of costs of the improvements noted above including contingency (10%) and engineering (15%) total about \$200,000.

Some consideration might also be directed at implementing the type of pavement striping/ warnings implemented at an existing roadway curve along Elmwood Road north of Willow Bend Road. Finally, it may also be appropriate to consider some minor pavement/edge widening/improvement along short segments of Kettle Run Road. These additional actions should be considered after further engineering review (including the requested NJDOT re-evaluations).

If traffic demands along Kettle Run Road are to increase significantly in the future it is recommended that improvement be considered at two existing intersections — i.e., at Tomlinson Mill Road and at Braddock Mill Road. Specifically:

- The southbound lane of Tomlinson Mill Road at Kettle Run Road should be widened in advance of the intersection to provide for a bypass lane of vehicles waiting to turn left onto Kettle Run Road. The tree branches and vegetation on the inside of the curve should be selectively trimmed to improve sight distances. The area street lighting should be upgraded. Recommended geometric improvements are shown on the attached sketch (Figure 2).
- The intersection of Braddock Mill Road with Kettle Run Road should be modified by channelizing the Braddock Mill Road approach to form a 'T'-intersection with channelized right turns in and out. As an interim step, additional pavement markings should be installed to provide for a more defined travel path. Suggested geometric improvements are shown on the attached sketch (Figure 3).

Preliminary, order-of-magnitude cost estimates for these improvements including contingency (10%) and engineering (12%) are as noted below:

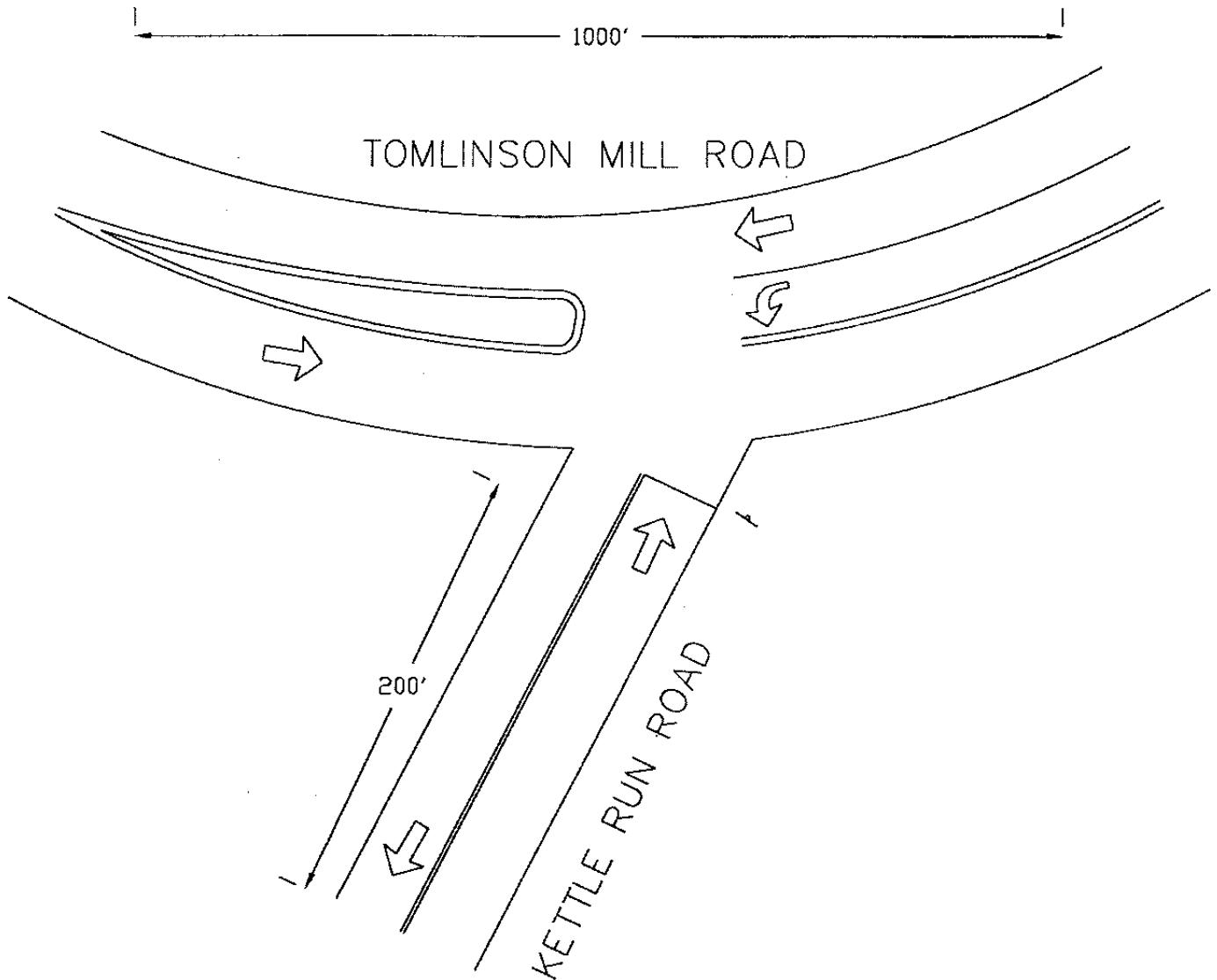
- Kettle Run Road and Tomlinson Mill Road	\$245,000
- Kettle Run Road and Braddock Mill Road	\$260,000

If the former Aerohaven Airport site is to be developed as a major sports/recreational complex the site access drive intersecting Kettle Run Road should be carefully located so as to ensure adequate sight distance. In addition, southbound Kettle Run Road should be widened to provide a separate left-turn lane for entry traffic and the northbound roadway should be widened to provide for a right-turn entry deceleration lane and a right-turn exit acceleration lane. The site drive itself should provide two exit lanes and one entry lane. A sketch of the proposed site access treatment is provided in Figure 4. Street lighting, intersection warning signs and advance guide signs should also be provided. Preliminary, order-of-magnitude cost for site access treatment is estimated at \$350,000 (including 10% contingency and 12% engineering cost).

In total, recommended road/intersection improvements along Kettle Run Road to provide for safer, more efficient movement of existing traffic and to better accommodate possible increases in demand which might be generated by a new sports/recreation complex at the Aerohaven site are estimated to cost \$1,055,000 (preliminary, order-of-magnitude estimate including contingency and engineering).

PROPOSED IMPROVEMENTS

KETTLE RUN ROAD AND TOMLINSON MILL ROAD
 EVESHAM TOWNSHIP
 BURLINGTON COUNTY, NEW JERSEY





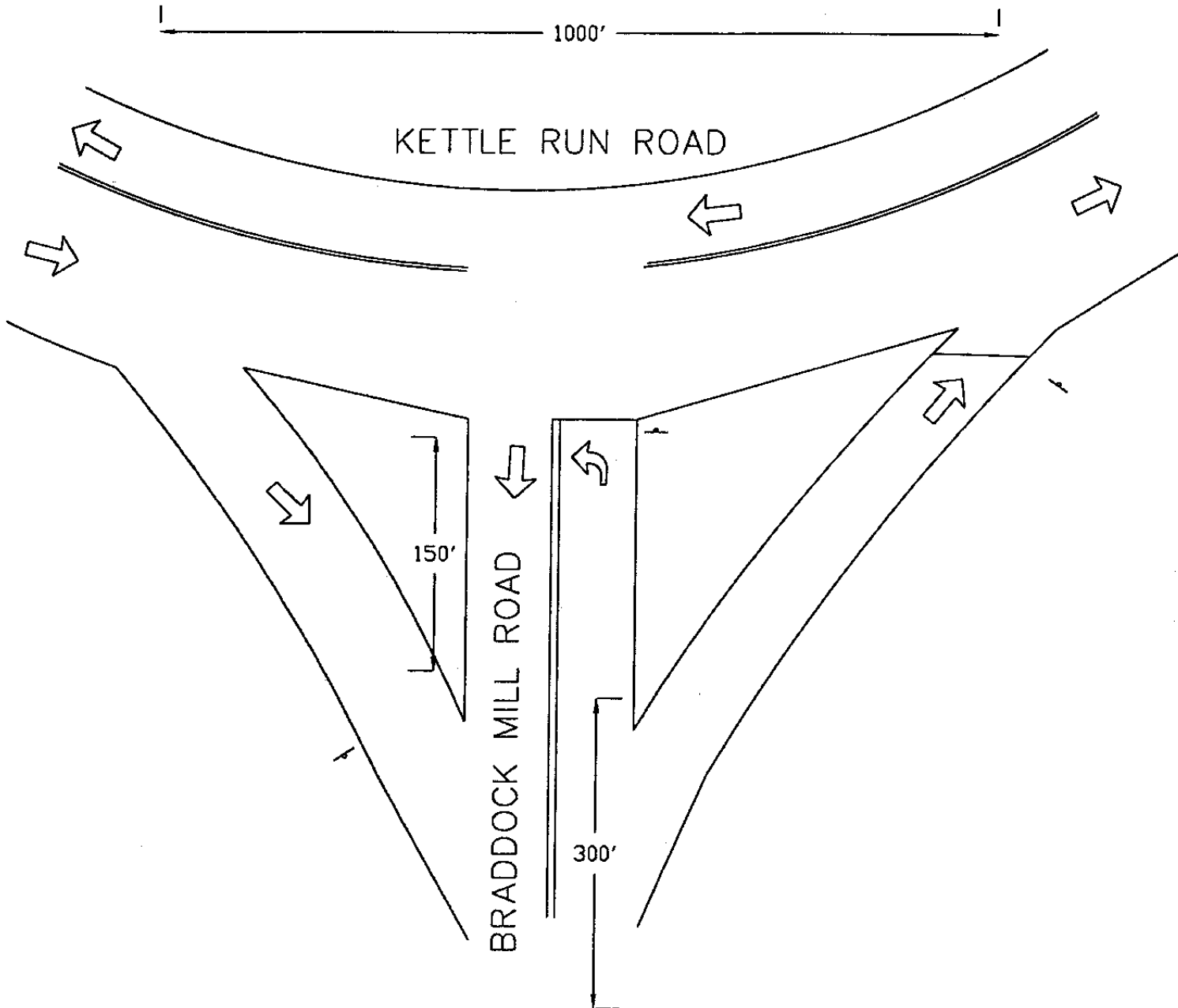
Orth - Rodgers and Associates, Inc.

TRANSPORTATION ENGINEERS and PLANNERS

FIGURE 3

PROPOSED IMPROVEMENTS

KETTLE RUN ROAD & BRADDOCK MILL ROAD
EVESHAM TOWNSHIP
BURLINGTON COUNTY, NEW JERSEY



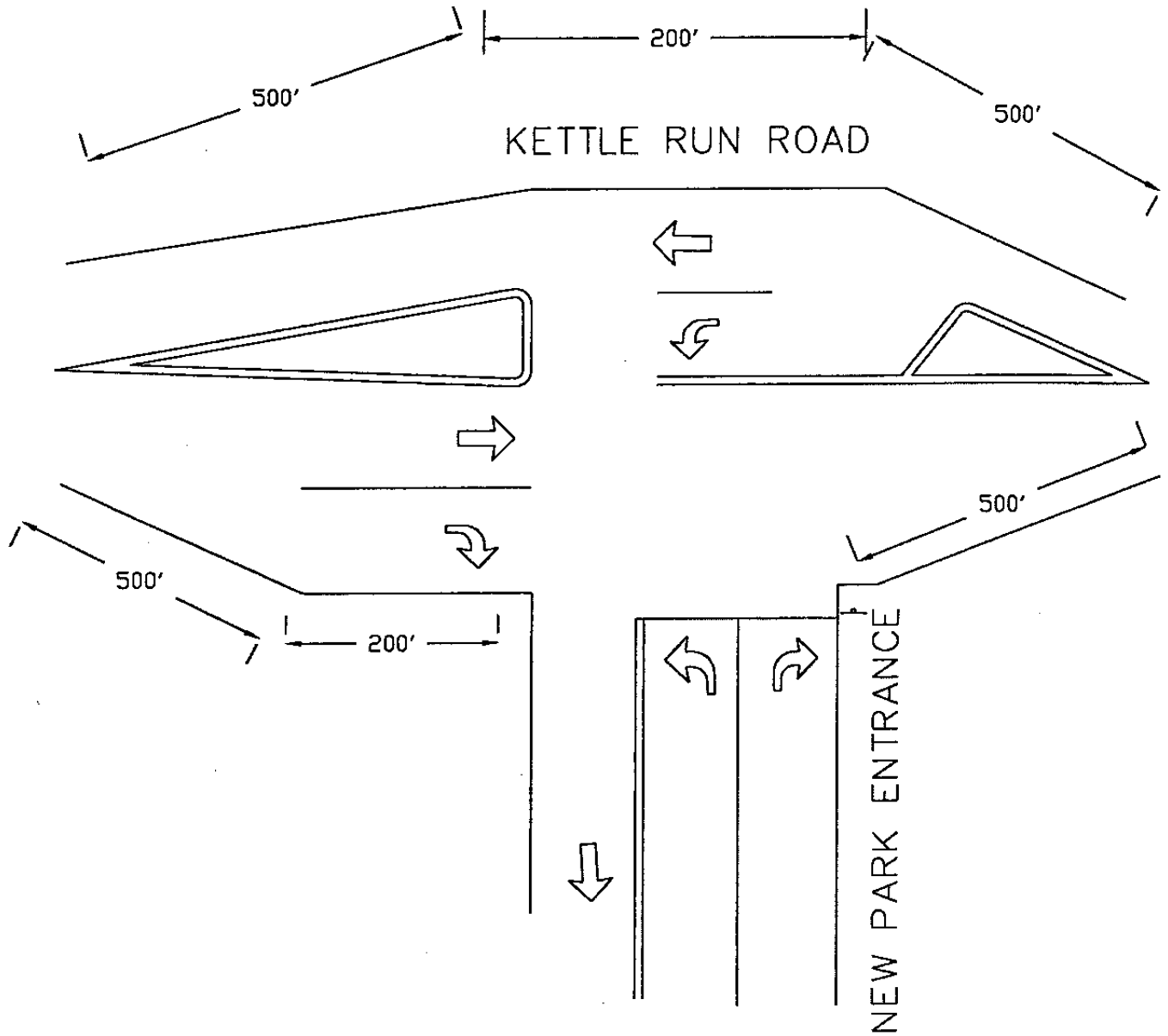


Orth - Rodgers and Associates, Inc.
TRANSPORTATION ENGINEERS and PLANNERS

FIGURE 4

PROPOSED IMPROVEMENTS

KETTLE RUN ROAD
EVESHAM TOWNSHIP
BURLINGTON COUNTY, NEW JERSEY



It should also be noted that Kettle Run Road, despite its narrow cartway, appears to be used by a number of bicyclists. If a sports/recreation complex is developed on the Aerohaven site it might be appropriate to consider construction of some form/type of bicycle paths. Given existing environmental constraints along the Kettle Run Road alignment it may not be feasible to provide such a path adjacent to the existing roadway. However, it may be feasible to provide a bicycle path linkage to the Kings Grant community and such a linkage might be considered.

APPENDIX

AUTOMATIC TRAFFIC RECORDER COUNTS

KETTLE RUN ROAD, TOMLINSON MILL ROAD AND HOPEWELL ROAD IN EVESHAM TOWNSHIP